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## PATENT ABSTRACTS OF JAPAN

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(71)Applicant:

**HITACHI LTD**

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(72)Inventor:

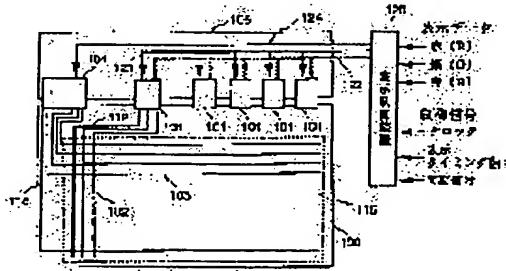
**KURIHARA HIROSHI  
 TANAKA TAKESHI  
 IKEDA MAKIKO  
 MISHIMA YASUYUKI**

## (54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PURPOSE: To make it possible to form the display region larger than the outside dimension of a liquid crystal display panel by arranging plural driving circuits for supplying liquid crystal layer driving voltage to plural electrodes of the liquid crystal display panel on one side of the liquid crystal display panel.

CONSTITUTION: The liquid crystal display panel 100 is composed of 640×3×480 pixels. A drain driver 101 and gate driver 104 composed of driving IC chips are arranged on one side of such panel. The output of the drain driver 101 is supplied by wirings 112 for drain to the signal electrodes 102 and the output of the gate driver 104 is supplied by gage wirings 113 to the scanning electrodes 103. The respective signal



electrodes 102 are connected to the drain terminal of thin-film transistor(TFTs) in the column direction and the scanning electrodes 103 are connected to the gate terminals of the TFTs in the row direction. As the result, the area of the picture frame of the liquid crystal display panel 100 is made smaller and the formation of the display region to have a size larger than the outside dimension of the liquid crystal display panel is made possible.

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**LEGAL STATUS**

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CLAIMS

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[Claim(s)]

[Claim 1] The LCD characterized by having arranged two or more above-mentioned drive circuits to one side of the above-mentioned liquid-crystal-display panel in the LCD which has at least the liquid-crystal-display panel which has two or more electrodes formed on one [ at least ] substrate of the substrate of the couple which pinches a liquid crystal layer, and the substrate of the above-mentioned couple, and two or more drive circuits which supply the voltage which drives the above-mentioned liquid crystal layer to two or more electrodes of the above-mentioned liquid-crystal-display panel.

[Claim 2] The LCD indicated by the claim 1 characterized by for the above-mentioned liquid-crystal-display panel changing, having a means, changing the voltage which drives the above-mentioned liquid crystal layer supplied by time sharing from two or more above-mentioned drive circuits with the above-mentioned change means, and supplying two or more above-mentioned electrodes.

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[Translation done.]



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**DETAILED DESCRIPTION**

[Detailed Description of the Invention]

[0001]

[Field of the Invention] With respect to a LCD, especially this invention is applied to \*\* space-ization of the frame fraction in a liquid-crystal-display panel, and relates to effective technique.

[0002]

[Description of the Prior Art] Conventionally, the liquid-crystal-display module of TFT method is well-known as one of the LCDs.

[0003] Drawing 8 is a block diagram showing the outline configuration of the above-mentioned liquid-crystal-display module.

[0004] As for the display controller with which a gate driver (gate drive circuit) and 110 consist of a viewing area, and 120 consists of [ a drain driver (drain drive circuit) and 102 / a signal electrode and 103 ] one semiconductor integrated circuit (LSI:Large Scale Integrated circuit) for a scanning electrode and 104, and 121 and 124, for 100, in drawing 8, the liquid-crystal-display panel (LCD:LiquidCrystal Display) of TFT method and 101 are [ a control signal line and 122 ] data buses.

[0005] The liquid-crystal-display panel 100 consists of 640x3x480 pixels, and the drain driver 101 is arranged at the upper and lower sides of this liquid-crystal-display panel 100.

[0006] Each signal electrode 102 connected to the output terminal of the above-mentioned drain driver 101 is connected to the drain terminal of the TFT (TFT:Thin Film Transistor) of the orientation of a train by turns, and the signal level for driving liquid crystal from the drain driver 101 to TFT is supplied.

[0007] moreover, each which the gate driver 104 is arranged at the side face of the liquid-crystal-display panel 100, and is connected to the output terminal of the gate driver 104 -- the scanning electrode 103 is connected to the gate terminal of the TFT of a line writing direction

[0008] 1 level operating-time scanning voltage is supplied to each scanning electrode 103 from the above-mentioned gate driver 104, and a scanning voltage is supplied to the gate of each TFT of 1 level operating-time line writing direction.

[0009] Moreover, from the above-mentioned gate driver 104, a common voltage is further supplied to a common electrode.

[0010] The display controller 110 which consists of one semiconductor integrated circuit (LSI:Large Scale Integrated circuit) receives the data for a display and the display-control signal from a computer of a mainframe, and drives the drain driver 101 and the gate driver 104 on the basis of this.

[0011] Moreover, since the drain driver 101 is arranged up and down, the control signal 121 and the data bus for a display 122 have two signals for driving this drain driver 101.

[0012] In addition, the area shown by the dotted line is the viewing area 110 of the liquid-crystal-display panel 100.

[0013]

[Problem(s) to be Solved by the Invention] However, in the liquid-crystal-display module shown in the above-mentioned view 8, since the drain driver 101 is arranged at the upper and lower sides of the liquid-crystal-display panel 100, the fraction of the frame of a liquid-crystal-display module needs the same length (area) for the upper and lower sides.

[0014] Furthermore, since the gate driver 104 is arranged on left-hand side, the fraction of the frame of a liquid-crystal-display module needs a big area also for left-hand side."

[0015] On the other hand, as one of the commercial-scene needss, a viewing area 110 is large and a frame has demand of being as small as possible.

[0016] Moreover, since the number of the TFT connected to one signal electrode 102 or the scanning electrode 103 increased sharply when performing big screen-ization of a liquid crystal display, there was a problem that the number of 104 of the drain driver 101 and a gate driver will increase sharply.

[0017] It is made in order that this invention may solve the trouble of the above-mentioned conventional technique, and the purpose of this invention is in a LCD to offer the technique which can enlarge a viewing area to the dimension of a liquid-crystal-display panel.

[0018] Moreover, other purposes of this invention are in a LCD to offer the technique which becomes possible [ reducing the number of the drive circuits which impress a driver voltage to two or more electrodes in a liquid-crystal-display panel ].

[0019] The purpose of the above and others of this invention and the new characteristic feature will become clear by description and the accompanying drawing of this specification.

[0020]

[Means for Solving the Problem] It is as follows if the schema of a typical thing is briefly explained among invention indicated in \*\*\*.

[0021] (1) In the LCD which has at least the liquid-crystal-display panel which has two or more electrodes formed on one [ at least ] substrate of the substrate of the couple which pinches a liquid crystal layer, and the substrate of the above-mentioned couple, and two or more drive circuits which supply the voltage which drives the above-mentioned liquid crystal layer to two or more electrodes of the above-mentioned liquid-crystal-display panel, it is characterized by having arranged two or more above-mentioned drive circuits to one side of the above-mentioned liquid-crystal-display panel.

[0022] (2) In the means of the above (1), the above-mentioned liquid-crystal-display panel changes, and it has a means, and is characterized by changing the voltage which drives the above-mentioned liquid crystal layer supplied by time sharing from two or more above-mentioned drive circuits with the above-mentioned change means, and supplying it to two or more above-mentioned electrodes.

[0023]

[Function] Since two or more drive circuits which supply the voltage which drives a liquid crystal layer to two or more electrodes of a liquid-crystal-display panel were arranged to one side of a liquid-crystal-display panel according to the means of the above (1), it is enabled to make small area of the frame of a liquid-crystal-display panel, and is enabled to enlarge a viewing area to the dimension of a liquid-crystal-display panel.

[0024] Since according to the means of the above (2) the voltage which drives the liquid crystal layer by which changes to a liquid-crystal-display panel, and establishes a means, and time-sharing supply is carried out from two or more drive circuits is changed with a change means and supplied to two or more electrodes, it is enabled to reduce the number of drive circuits.

[0025]

[Example] Hereafter, this invention is explained in detail with reference to a drawing about the example applied to the liquid-crystal-display module.

[0026] In addition, in the complete diagram for explaining an example, what has the same function attaches the same sign, and an explanation of the repeat is omitted.

[0027] [Example 1] view 1 is the block diagram showing the outline configuration of the liquid-crystal-display module which is one example (example 1) of this invention.

[0028] drawing 1 -- setting -- 100 -- the liquid-crystal-display panel of TFT method, and 101 -- a drain driver and 102 -- a signal electrode (drain signal line) and 103 -- a scanning electrode (gate signal line) and 104 -- a gate driver, and 105 -- as for a display controller, and 121 and 124, for the wiring for drains, and 113, the wiring for the gates and 120 are [ the drive circuit board and 110 / a viewing area and 112 / a control signal line and 122 ] data buses

[0029] The liquid-crystal-display panel 100 consists of 640x3x480 pixels, and the drain driver 101 and the gate driver 104 are arranged at one side of this liquid-crystal-display panel 100.

[0030] Here, the drain driver 101 and the gate driver 104 consist of a drive IC chip, respectively.

[0031] In addition, the above-mentioned drive IC chip is mounted in a tape carrier package by the tape automation \*\*\*\*\* bonding method (TAB), and the above-mentioned tape carrier package is further carried in the circuit board for a drive 105 together with a capacitor etc.

[0032] The output of the above-mentioned drain driver 101 is supplied to a signal electrode 102 with the wiring for drains 112.

[0033] Similarly, the output of the above-mentioned gate driver 104 is supplied to the scanning electrode 103 with the wiring for the gates 113.

[0034] The above-mentioned wiring for drains 112 and the wiring for the gates 113 are formed by the electrode of a conductor layer using detailed manipulation technique as well as the signal electrode 102 and the scanning electrode 103.

[0035] Moreover, each signal electrode 102 is connected to the drain terminal of the TFT of the orientation of a train, and each scanning electrode 103 is connected to the gate terminal of the TFT of a line writing direction.

[0036] Here, the above-mentioned signal electrode 102 and the scanning electrode 103 lie at right angles mutually.

[0037] Moreover, from the above-mentioned gate driver 104, a common voltage is further supplied to a common electrode.

[0038] in this case, the area occupied on the side face of the liquid-crystal-display panel 100 since the wiring for the gates 113 which supplies the output of the gate driver 104 to the scanning electrode 103 can be formed by the same width of face as the scanning electrode 103 -- \*\*\* -- small

[0039] A display controller 120 has the role of the interface with a main frame computer, and a drive of the drain driver 101 and the gate driver 104 is performed on the basis of the clock, the data for a display, and the synchronizing signal which are a control signal transmitted from a main frame computer.

[0040] The control units 120 of the liquid-crystal-display module of this example 1 differ in the control unit 120 of the liquid-crystal-display module shown in the above-mentioned view 8, and output the indicative data of simple 1 train transmitted from a main frame computer to the drain driver 101.

[0041] Since the signal electrode 102 and the scanning electrode 103 were arranged to one side of the liquid-crystal-display panel 100 according to this example 1 as explained above, area of the frame of the liquid-crystal-display panel 100 can be made small, and it is enabled to enlarge a viewing area compared with the dimension of a LCD.

[0042] [Example 2] view 2 is the block diagram showing the outline configuration of the LCD which are other examples (example 2) of this invention.

[0043] drawing 2 -- setting -- 100 -- a liquid-crystal-display panel and 101 -- a drain driver and 102 -- a signal electrode and 103 -- a scanning electrode and 104 -- a gate driver and 105 -- for a viewing area and 112, as for the wiring for the gates, and 501, the wiring for drains and 113 are [ 110 / a scanning electrode selection circuitry and 502 ] signal-electrode selection circuitries about the drive circuit board

[0044] The scanning electrode selection circuitry 501 shown in drawing 2 drives 2n scanning electrode by changing the output of n output terminals of the gate driver 104, and the signal-electrode selection circuitry 502 drives 2m signal electrode by changing the output of m output terminals of the drain driver 101.

[0045] In addition, the scanning electrode selection circuitry 501 and the signal-electrode selection circuitry 502 constitute the change means of this invention.

[0046] Drawing 3 is a block diagram showing the outline configuration of the scanning electrode selection circuitry 501 shown in drawing 2.

[0047] In drawing 3 , 601 is a switch, and when the signal level of a "switch terminal" is "H", when the signal level of a "switch terminal" is "L", it outputs the scanning voltage inputted from

"in terminal" to "out1 terminal" at "out2 terminal", respectively.

[0048] The above-mentioned scanning electrode selection circuitry 501 drives n scanning 2 electrodes 103 with the output of n output terminals of the gate driver 104 using n switches 601 by changing the n above-mentioned switches 601 by the scanning electrode selection-circuitry change signal.

[0049] Drawing 4 is drawing showing an example of the connection technique of the above-mentioned scanning electrode selection circuitry 501 and a scanning electrode (G1 - G2n).

[0050] Although it is necessary to form in the same field the scanning electrode connection wiring (SG1 - SG2n) connected with the scanning electrode in the above-mentioned scanning electrode selection circuitry 501 (G1 - G2n), a scanning electrode connection wiring (SGn+1 - SG2n) intersects a scanning electrode connection wiring (SG1-SGn) so that clearly from drawing 4.

[0051] Therefore, by the connection technique shown in drawing 4, as it lets the bottom of an insulator layer pass for a scanning electrode connection wiring (SGn+1 - SG2n), it is made to form a scanning electrode connection wiring (SG1 - SG2n) in the same field.

[0052] Drawing 5 is a block diagram showing the outline configuration of the signal-electrode selection circuitry 502 shown in drawing 2.

[0053] In drawing 5, 701 is a switch, and when the signal level of a "switch terminal" is "H", when the signal level of a "switch terminal" is "L", it outputs the signal level (for example, signal level of 64 gradation) inputted from "IN terminal" to "out1 terminal" at "out2 terminal", respectively.

[0054] The above-mentioned signal-electrode selection circuitry 502 drives m 2 signal electrodes 102 with the output of m output terminals of the drain driver 101 using m switches 701 by changing a switch 701 by the signal-electrode selection-circuitry change signal.

[0055] In addition, an ordinary switching element is used as the switch 601 and a switch 701.

[0056] Drawing 6 is drawing showing the timing chart of the scanning electrode selection circuitry 501 shown in drawing 2.

[0057] An operation of the scanning electrode selection circuitry 501 is explained using drawing 6.

[0058] In drawing 6, X1-Xn show the scanning voltage outputted from each output terminal of the gate driver 104, and the gate driver 104 outputs "the scanning voltage of H level" to the output terminal of eye "n" watch one by one from the output terminal of the "1st" watch.

[0059] Moreover, after outputting "the scanning voltage of H level" from the output terminal of eye "n" watch, it returns to the output terminal of the "1st" watch, and it outputs "the scanning voltage of H level" to the output terminal of eye "n" watch one by one from the output terminal of the "1st" watch again.

[0060] The gate driver 104 repeats the above mentioned operation with the period of T0-Tn-1.

[0061] On the other hand, a scanning electrode selection-circuitry change signal changes with the period of T0 - T2n, "H" is outputted in between from T0 to Tn-1, and "L" is outputted between Tn - T2n.

[0062] Consequently, since a scanning electrode selection-circuitry change signal is chosen between "H" (i.e., between T0-Tn-1) and, as for the switch 601, "out1" is chosen, a scanning voltage is outputted to G1-Gn in order.

[0063] On the other hand, while a scanning electrode selection-circuitry change signal is between "L" (i.e., Tn - T2n), since "out2" is chosen, as for the output of a digital switch 601, a scanning voltage is outputted to Gn+1 - G2n in order.

[0064] Henceforth, 2nthe scanning electrode G1 - G2n can be driven with the output of n gate drivers by repeating an operation of the above T0 - T2n.

[0065] Drawing 7 is drawing showing the timing chart of the signal-electrode selection circuitry 502 shown in drawing 2.

[0066] Signal-electrode selection-circuitry 502 operation is explained using drawing 7.

[0067] Here, the drain driver 101 has m output terminals, and drives the 2m signal electrode 102.

[0068] Therefore, the signal-electrode selection circuitry 502 connects the output terminal and signal electrode of the drain driver 101 so that the output terminal of eye "k" watch of the drain

driver 101 may drive 2 "2 The k-1st signal electrodes" and "the k-th signal electrode" which adjoin mutually.

[0069] In drawing 7, Sm shows the signal level of the output terminal of eye "m" watch of the drain driver 101.

[0070] By the drain driver 101 outputting a signal level in one half of the terms of one scanning interval, signal-electrode selection-circuitry change signals are one half of the terms of one scanning interval, are synchronized with the period of the drain driver 101 above-mentioned output, and are changed.

[0071] Therefore, in the term of T0-T1, a signal-electrode selection-circuitry change signal is "H", and since signal-electrode D2m-1 is connected to the output, signal-level Sm ("A0" shown in drawing 7) of the output terminal of eye "m" watch of the drain driver 101 is outputted to signal-electrode D2m-1.

[0072] In the next term of T1-T2, a signal selection-circuitry change signal is "L", and since signal-electrode D2m is connected to the output, signal-level Sm ("A1" shown in drawing 7) of the output terminal of eye "m" watch of the drain driver 101 is outputted to signal-electrode D2m.

[0073] Moreover, since "out1" of a switch 701 serves as a "high impedance", signal-electrode D2m-1 becomes [ that "A0" is outputted with as, and ].

[0074] Thus, the odd and even-numbered signal electrode 102 is changed into 1 scanning interval, and the signal level set to the 2m signal electrode D1 - D2m from m output terminals of the drain driver 101 with an indicative data is supplied.

[0075] If it depends this example 2 as explained above, the scanning electrode selection circuitry 501 and the signal-electrode selection circuitry 502 will be formed in the liquid-crystal-display panel 100, and it will be enabled to cut down the number of the gate driver 104 and the drain drivers 101 by on the other hand supplying the output of the drain driver 101 for the output of the gate driver 104 to a signal electrode 102 through the signal-electrode selection circuitry 502 through the scanning electrode selection circuitry 501 at the scanning electrode 103, respectively.

[0076] Furthermore, the wiring for the gates 113 and the wiring for drains 112 are set to one half, respectively, and since area of these wirings occupied in the frame of the liquid-crystal-display panel 100 can be made small, it is enabled to enlarge a viewing area 110 to the dimension of a LCD.

[0077] In addition, although the wiring for drains 112 and the wiring for the gates 113 were cut down to one half in this example 2, in the scanning electrode selection circuitry 501 and the signal-electrode selection circuitry 502, it cannot be overemphasized that the wiring for the gates 113 and the wiring for drains 112 can be further cut down with 1/3 and 1/4 by connecting with the signal electrode of i ( $i \geq 3$ ) book and i scanning electrodes.

[0078] Moreover, as TFT of each above-mentioned example, it is possible to use the MOS transistor on an amorphous silicon TFT element, a poly-silicon TFT element, and a silicon wafer and organic TFT, and it is also possible to replace with TFT and to use 2 terminal \*\*\*\*\*s, such as MIM (Metal-Insulator-Metal) diode, further.

[0079] Furthermore, this invention cannot be overemphasized by that it can apply not only to the LCD of TFT method but to a simple matrix type LCD.

[0080] As mentioned above, this invention cannot be overemphasized by that it can change variously in the domain which is not limited to the above-mentioned example and does not deviate from the summary although this invention was concretely explained based on the example.

[0081]

[Effect of the Invention] It is as follows if the effect acquired by the typical thing among invention indicated in \*\*\*\* is explained briefly.

[0082] (1) According to this invention, it is enabled to enlarge a viewing area to the dimension of the liquid-crystal-display panel in a LCD.

[0083] (2) According to this invention, it is enabled to reduce the number of the drive circuits which supply the voltage which drives a liquid crystal layer to each electrode of the liquid-crystal-display panel in a LCD.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

[Drawing 1] Drawing 1 is a block diagram showing the outline configuration of the liquid-crystal-display module which is one example (example 1) of this invention.

[Drawing 2] It is the block diagram showing the outline configuration of the LCD which are other examples (example 2) of this invention.

[Drawing 3] Drawing 3 is a block diagram showing the outline configuration of the scanning electrode selection circuitry 501 shown in drawing 2.

[Drawing 4] It is drawing showing an example of the connection technique of the above-mentioned scanning electrode selection circuitry 501 and a scanning electrode (G1 - G2n).

[Drawing 5] It is the block diagram showing the outline configuration of the signal-electrode selection circuitry 502 shown in drawing 2.

[Drawing 6] It is drawing showing the timing chart of the scanning electrode selection circuitry 501 shown in drawing 2.

[Drawing 7] It is drawing showing the timing chart of the signal-electrode selection circuitry 502 shown in drawing 2.

[Drawing 8] It is the block diagram showing the outline configuration of the conventional liquid-crystal-display module.

**[Description of Notations]**

100 [ -- A signal electrode (drain signal line), 103 / -- A scanning electrode (gate signal line),  
104 / -- A gate driver, 105 / -- The drive circuit board, 110 / -- A viewing area, 112 / -- The wiring  
for drains,, 113 / -- The wiring for the gates,, 120 / -- A display controller,, 121, 124 / -- A control  
signal line, 122 / -- A data bus, 501 / -- A scanning electrode selection circuitry, 502 ] -- The  
liquid-crystal-display panel of TFT method,

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[Translation done.]



## \* NOTICES \*

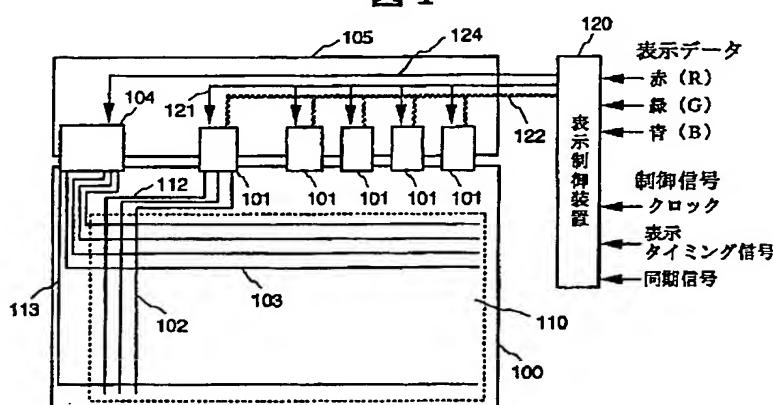
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## DRAWINGS

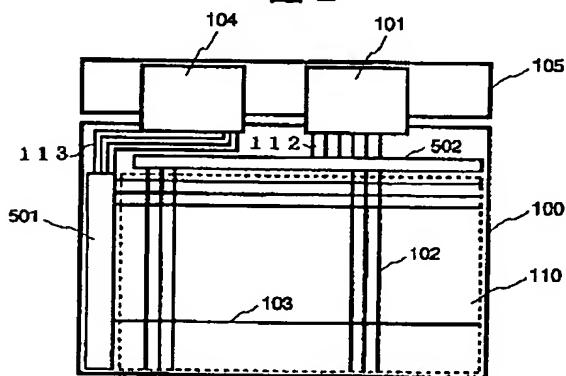
## [Drawing 1]

図 1



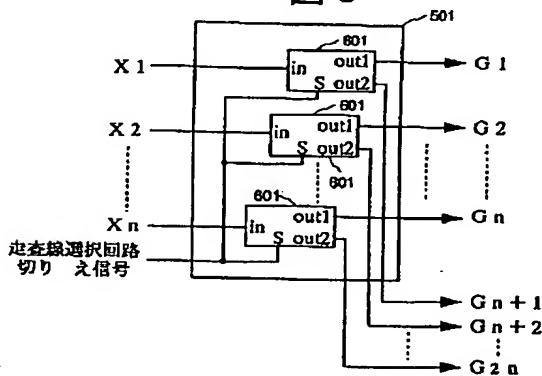
## [Drawing 2]

図 2

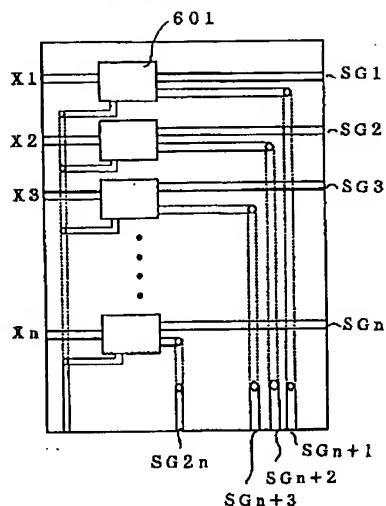


## [Drawing 3]

図 3

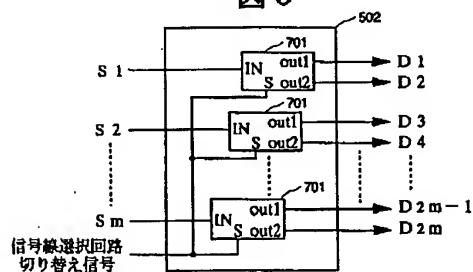


[Drawing 4]  
図 4



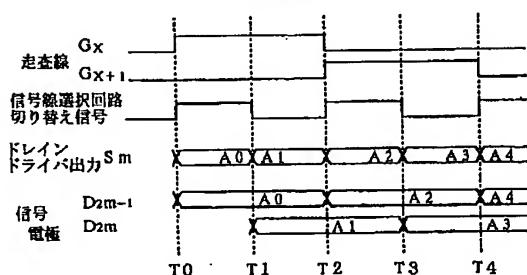
[Drawing 5]

図 5



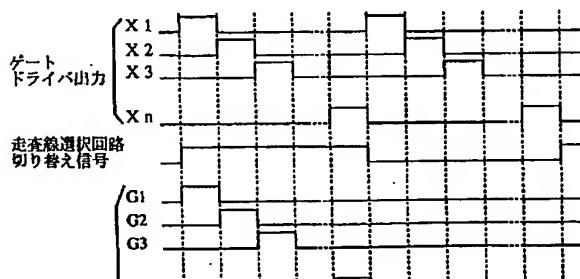
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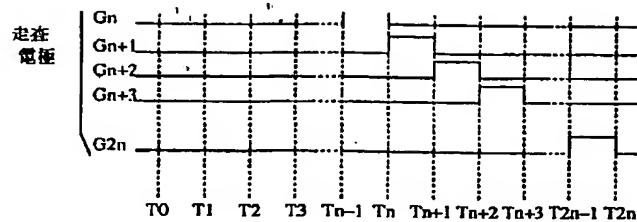
図 7



[Drawing 6]

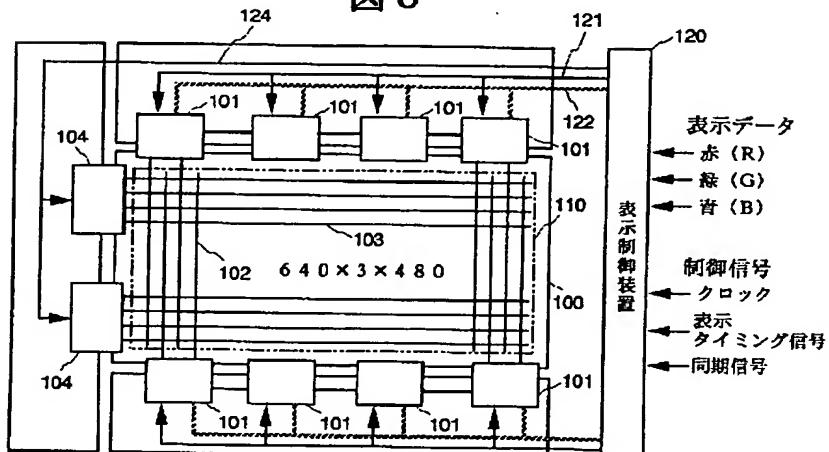
図 6





[Drawing 8]

図 8



[Translation done.]

